The Relationship between Young’s Modulus and Rigidity

Young’s modulus (stretch or vertical elasticity coefficient) and the rigidity coefficient (shear or horizontal elasticity coefficient) can be found with the DMS110 (or 120), depending on the measurement mode.

- Flexure mode → Young’s modulus measurement
- Shear mode → Rigidity coefficient measurement

The volume elasticity coefficient $K$, the Poisson ratio $\sigma$, Young’s modulus $E$, and the rigidity coefficient $G$ are all practical elasticity coefficients of isotropic materials. Only two of these elasticity coefficients are independent. The others can be derived from them.

In other words,

\[
\sigma = \frac{E - 2G}{2G} \quad \text{and} \quad \frac{EG}{9G - 3E}.
\]

For many materials $\sigma = 0.5$. If we apply this assumption to equation 2, we find that $E = 3G$. This relationship is called the “3-times rule of elasticity coefficients,” and is very helpful in data conversion and comparison.